

Minor Exam

CAD and Finite Element Analysis (MCL 311)

Date: 17/03/2021

Start Time: 11:00 am

Duration: 1 Hr

Total marks: 30

1. For the given spring-mass system (Fig. 1),
 - (i) write down the total potential energy expression.
 - (ii) derive the equilibrium equation using the principle of total potential energy approach and express it in the form of $Kq=F$
 - (iii) Is the K matrix singular?

[3+6+1=10]

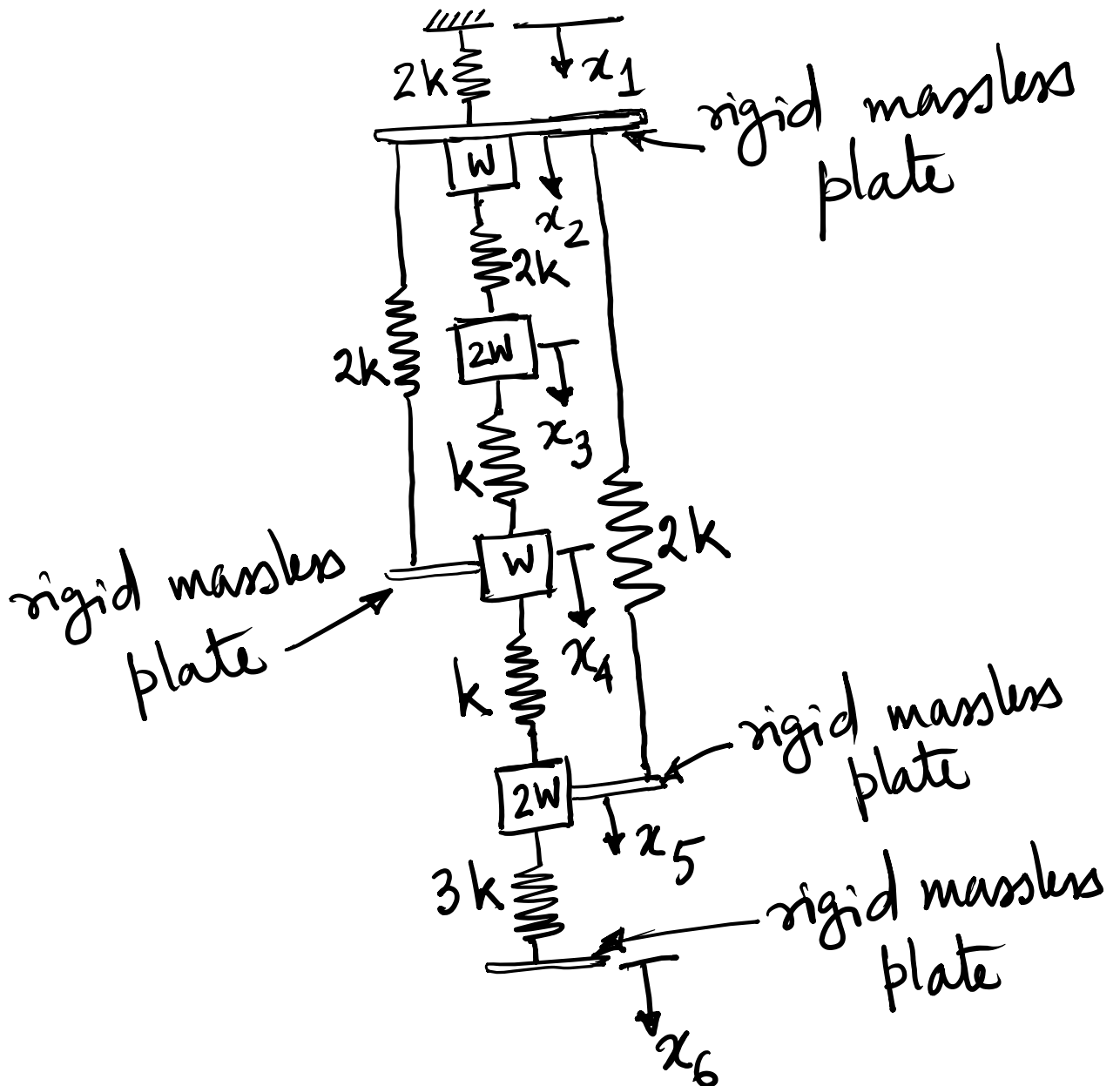


Fig - 1

2. The given rod is discretized using six linear bar elements in the way shown in Fig. 2.

Write down the following:

- (i) node-element connectivity table
- (ii) element stiffness matrices for all the elements
- (iii) Global stiffness matrix
- (iv) Following the elimination approach, derive the three matrices of the expression $K'Q'=F'$

[2+6+3+3=14]

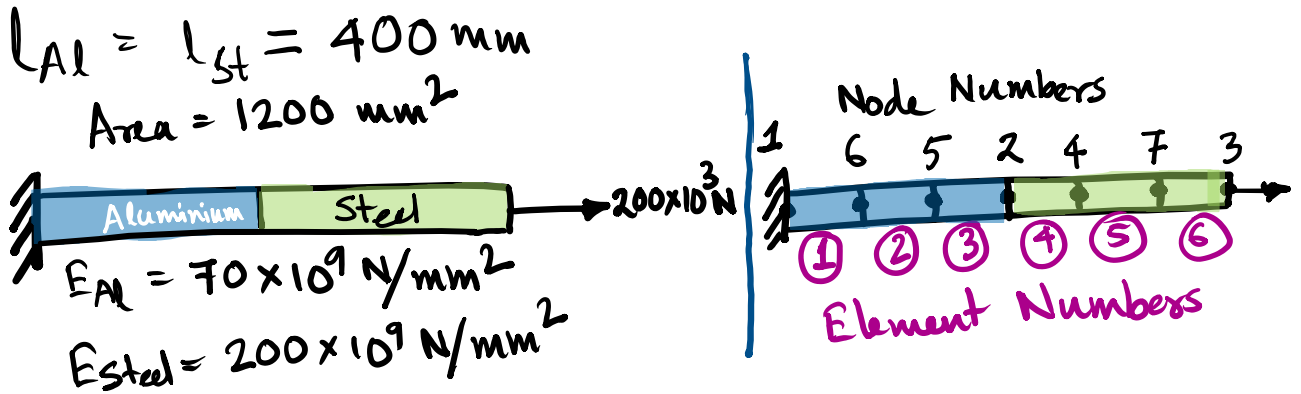


Fig. 2

3. Evaluate the shape function N_1, N_2 and N_3 at the point P for the triangular element shown in Fig. 3.

[2+2+2=6]

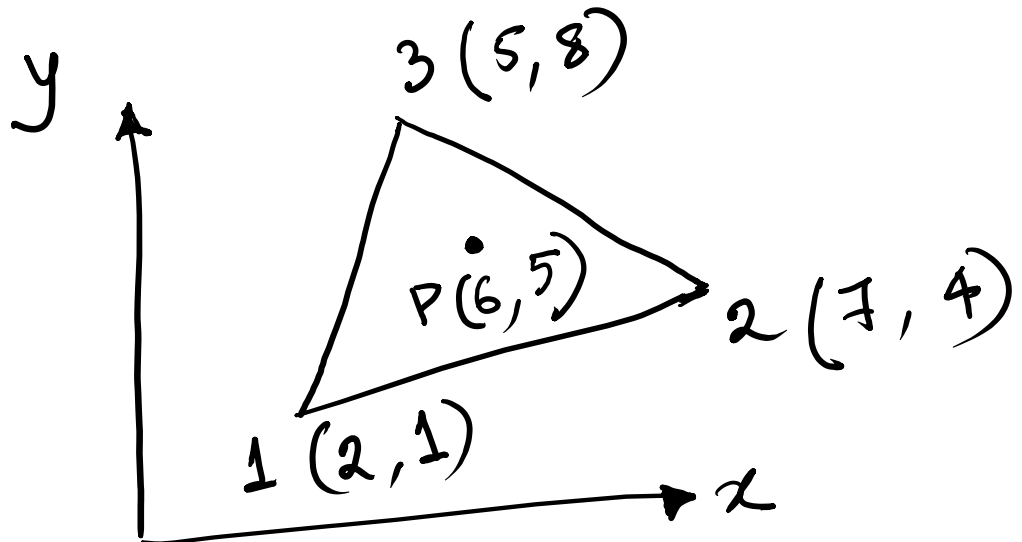


Fig. 3